STUDENT HANDOUT

BASIC SHOOTING TECHNIQUES

1. **Steady Position** Fire form a supported position whenever possible. Allow support (sandbags, log, tree, etc.) to bear weight of Weapon but do not allow weapon to rest directly on support. If possible, *lean into* support. If no support is available, adjust body to achieve maximum weapon stability.

   Steady Position Elements:
   1. Non firing Hand and Arm (under rifle for support).
   2. Rifle Butt (well into shoulder pocket).
   3. Firing Hand (placed to ease trigger manipulation)
   4. Firing Elbow (placed to balance position).
   5. Stock weld (consistent, upright head position).

   Additional Elements of a Good Position:
   6. Bone/Artificial Support (sandbags, equipment, bones, etc.)
   7. Muscular Relaxation (comfort + stability)
   8. Natural Point of Aim (front sight on target w/o strain).

2. **Aiming** Aiming consists of:
   1. Eye relief (distance from firing eye to rear sight, same from shot to shot in any given position).
   2. Sight Alignment (top edge of front sight post centered in rear aperture).
   3. Sight Picture (Top edge of front sight post centered in largest visible mass of target; often called placement of aiming point)

3. **Breath Control** Stop breathing at natural respiratory pause to fire shot. When discomfort is felt, breath has been held too long. Modify breathing cycle for multiple or limited exposure targets.

4. **Trigger Squeeze** Better thought of as Trigger Control, it is most important of fundamentals. Trigger must be controlled and squeezed so that weapon fires when front side post is in a position to insure a target hit. <u>As long as the other three fundamentals are correctly applied,</u> a smooth, steady, even squeeze straight to the rear on the trigger will <u>normally</u> result in a target hit.

<u>To fire a well-aimed shot:</u>

1. Build a stable, steady, comfortable firing position.
2. Align front and rear sights and place front sight post at desired location.
3. Stop breathing at respiratory pause.
4. Squeeze/control trigger, keeping eye focused on front sight post.
5. Follow through during recoil.
6. Call shot.

ZERO AN M16A2 RIFLE

TRAINING AND EVALUATION

1. **The M16A2 rifle has two adjustable sights** – front and rear. Elevation adjustment are made using the front sight, and elevation changes and windage adjustments are made using the rear sight.
2. **The sight systems**.
   a. The rear sight has an elevation knob with range indicator form 300 to 800 meters and two apertures for range. One aperture is marked 0-2 for short range from 0-200 meters and an unmarked aperture for normal range from 300 to 800 meters.

(1) The 0-2 (large) aperture is used for short range.
The aperture is used only when the rear sight is all the way down. The 8/3 (300 meters) mark on the elevation knob is aligned with the index mark on the left side of the receiver.

(2) The unmarked (small) aperture is used for normal range. This aperture is used for most firing situations. It is used in conjunction with the elevation knob for 300- to 800-meter targets.

b. The rear sight also consists of a windage knob on the right side of the sight (figure 109).

(1) Each click of the windage knob will move the strike of the round form 1/8 inch (.3 centimeters) at 25 meters to 4 inches (10 centimeters) at 800 meters.

(2) A windage scale is on the rear of the sight and the windage knob pointer is on the windage knob.

c. The front sight consists of a rotating sight post with a spring loaded detent The front sight is moved up or down when zeroing the rear sight.

(1) Once the rear sight is zeroed, the front sight post should not be moved.

(2) Each notch on the front sight will move the strike of the bullet 3/8 inch (0.9 centimeters) to 2 ¾ inches (7 centimeters) at 200 meters.

3. Sight adjustments

a. Rear sight.

(1) To adjust windage or move the strike of the round, turn the windage knob counterclockwise to move the strike to the left and clockwise to move the strike to the right.

(2) To adjust elevation, turn the elevation knob until the desired range is indexed at the index mark on the left side of the sight.

b. Front sight. To adjust elevation, depress the detent and rotate the sight post.To raise the strike of the round, rotate the sight post in the direction of the arrow marked UP. Reverse the direction of rotation to lower the strike.

4. **Zero the rifle**. The following steps will establish a zero at 25 meters, your M16A2 rifle sights will be set with a 300-meter battle sight zero.

a. Establish mechanical zero on the rifle.

(1) Align the windage indicator mark on the 0-2 aperture with the center line of the windage scale (the unmarked aperture is up).

(2) Rotate the elevation knob down until the range scale 8/3 (300 meters) mark is aligned with the mark on the left side of the receiver.

(3) Rotate the front sight post up or down as required until the base of the front sight post is flush with the top of the sight post well.

b. Zero at 25 meters.

(1) After setting the front and rear sights to mechanical zero, the elevation knob is rotated up (clockwise) one click past the 8/3 (300 meter) mark. The elevation knob will remain in this position until the battle sight zeroing has been completed.

Note: Any change is elevation required during the zeroing procedures will be made using the front sight post only.

(2) Carefully aim and fire each shot of a three-round shot group at the circle of the silhouette.

(3) If your shot group is not within the circle on the silhouette, use the squares on the target to determine the required clicks to move your next shot group into the circle.

Note: The squares are numbered around the edges of the target to equal the number of clicks required to move the shot group to the circle.

(4) To raise your next shot group, rotate the front sight post **UP** (clockwise). To lower your next shot group, rotate the front sight post **down** (counterclockwise). Once click will move the strike of the round one square on the target.

(5) To move the shot group to the left, turn the windage knob counterclockwise. To move the shot group to the right, turn the windage knob clockwise. Three clicks of the windage knob will move the strike of the round one square on the target.

(6) Continue to fire three-round shot groups and make corrections until you have a tight shot group in the circle on the silhouette.

(7) If your shot group is within the circle, your rifle is now “calibrated”.

(8) To place your 300-meter zero on the rifle, you must rotate the elevation knob one click counterclockwise. The 8/3 (300 meters) mark on the elevation knob should now be aligned with the index mark on the left side of the sight.

NOTES: 1. There are clicks between the range numbers as you turn the elevation knob. Use these clicks if you need more elevation past a certain range number to hit a target.

2. The unmarked aperture is automatically zeroed to 200 meters. Use the 0-2 aperture when shooting at night or at close range; for example, in an urban environment or in dense jungle.

5. Sight setting. Your rifle sights should be kept set to a combat zero of 300 meters. If you are told to engage a target at a longer range; for example, 500 meters:

a. Rotate the elevation knob so that the desired range mark is aligned with the index mark on the left side of the sight.

b. Engage the target.

c. When the engagement is over, return the sight to the 300-meter setting.

NOTE: When the rifle has been zeroed to 300 meters, all other ranges on the elevation knob are also zeroed.

THE FACTORS WHICH AFFECT BALLISTICS OF M16A2 RIFLE FIRE

Ballistics is a science dealing with the motion and flight characteristics of projectiles. This learning event discusses ballistics that applies to M16A2 rifles. The study falls into three categories:

- Internal ballistics concerns what happens to the bullet before it leaves the muzzle of the rifle.

- External ballistics deals with factors affecting the flight path of the bullet between the muzzle of the weapon and the target.

- Terminal ballistics deals with what happens to the bullet when it comes in contact with the target.

Commanders and marksmanship trainers need to understand ballistics because of moving target training, engagement of long-range targets and the introduction of lasers to rifle training.

BASIC PRINCIPLES

When the bullet is launched into the earth's atmosphere at some 2,200 miles per hour, it is acted upon by various forces and elements. As the temperature rises, the bullet hits higher on the target. As the air pressure rises, the bullet hits lower. The higher the humidity, the lower the bullet strikes. A strong tailwind causes the bullet to hit high, while a strong headwind causes the bullet to hit low.

Shooting uphill or downhill normally causes the bullet to hit high. Changing light conditions (bright to cloudy, different sun angles) can affect aiming and cause the bullet to hit in different locations.

There are also several slight differences in each round fired (bullet shape and weight, powder charge, chamber pressure, muzzle velocity) that influence the flight of the bullet. For these reasons, you will probably never see three bullets in the same target hole. However, these variable forces and elements have a small impact on the bullet.

This learning event will discuss the ballistic factors which can influence your performance. These factors you must understand.

GRAVITY AND FLIGHT TIME

When the bullet leaves the muzzle of the rifle, it falls at the same speed as it would if it was dropped by hand. It will drop 24 inches in just over 1/3 second.

When first fired, the bullet travels very fast. It covers the first 25 meters at an average speed of almost 2,200 mph. At 275 to 300 meters, that speed drops to around 1,450 mph. Gravity causes the rate of drop to increase as flight time increases.

In addition to gravity and flight time, the characteristics of the ammunition itself have an effect on the ballistics of the rifle.

M16A2 AMMUNITION

The M16A2 ball cartridge weighs 62 grains and is about 2.3 cm long. It also has a steel penetrator in the nose. The bullet's weight, length, and configuration require the M16A2 rifle to have a 1:7 twist barrel. This means that the bullet is rotated one time for each 7 inches of barrel length. This amount of twist is necessary to stabilize the bullet used in the M16A2 rifle.

As a rifleman, you may be required on occasion to use an M16A1 rifle which has a 1:12 twist. The bullet designed for use in the M16A1 rifle has a different length, weight, and configuration. However, it is also a 5.56-mm round, and therefore has the same outside dimensions as an M16 A2 round.

Because the outside dimensions are the same, either bullet can be *safely* fired from either rifle. However, the M16A2 round DO NOT fire *accurately* in M16A1 rifles. **The ammunition designed for the M16A2 rifle is the preferred choice for use in the M16A2 rifle.** However, the M16A2 rifle can fire M16A1 ammunition with little difference in accuracy out to ranges of 500 meters. When fired in the M16A2 rifle, the rounds designed for the M16A2 are more effective at ranges beyond 500 meters. They hold velocity better, are more resistant to wind effects, and have better penetration.

Because both weapons and both types of ammunition may be available in the Army inventory system for many years, you should take care NOT to fire the new M16A2 ammunition in the M16A1 rifle. Although it can be fired safely in the M16A1 and could be used successfully at close range, it is not as accurate. The 1:12 twist of the M16A1 rifle does not put enough spin on the new bullet to stabilize it in flight.

BULLET PENETRATION

The extent to which a bullet penetrates a target depends on such factors as range, velocity, bullet characteristics, and target material. The M16 ammunition can penetrate steel helmets with liners at a range of 550 meters and body armor at 700 meters.

It may appear that greater penetration would occur at close range. However, the high velocity of the 5.56 mm bullet causes it to disintegrate soon after impact with some materials, while greater penetration occurs in other materials after the bullet has lost velocity.

EFFECTS OF RANGE

Increasing the range to the target can have a direct effect on your accuracy. You need to understand how and why the size of your shot group at 25 meters will change as the range increases. To understand these effects, you must first know the concept of a minute of angle.

Minute of Angle

A minute of angle is the standard unit of measurement used in adjusting rifle sights and other ballistic-related measurements. It is used to indicate the accuracy of a rifle.

A circle is divided into 360 degrees. Each degree is further divided into 60 minutes, so that a circle contains 21,600 minutes. One minute of angle covers 1 inch at a distance of 100 yards. When the circle is increased to a radius of 200 yards, the same angle covers twice the distance, or 2 inches. This holds true as the range increases: 3 inches at 300 yards, 4 inches at 400 yards, and so on.

Adjustments on the M16A2 rifle for windage equal 0.5 minutes of angle for each click. Each click of adjustment for elevation on the front sight equals 1.25 minutes of angle. Each click on the rear elevation knob equals 1 minute of angle.

Increase of Shot Group Size

Just as the distance covered by a minute of angle doubles each time the range doubles, you can expect a shot group to do the same. If there is 1 inch between bullets on a 25-meter target, there will be an extra inch of dispersion for each 25 meters of range. For example, a 1-inch group at 25 meters will be a 10-inch group at 250 meters.

Standard 25-Meter Zero

A standard E-type silhouette is about 19 inches wide. An angle that covers 19 inches at 300 meters is equal to an angel that covers 4 cm at 25 meters. This means that a zero which is good enough to put all bullets with a 4-cm circle at 25 meters will produce hits on targets at a range of 300 meters.

Range Estimation

Before you can make any allowances for range, you must know the target distance. In training environments, the range to the target is known. Under these conditions, range estimation is not a required skill. In combat, however, you must be aware of target range. In a prepared defensive position, you should determine the range to various locations within your sector of fire. You would do this by pacing or other methods.

Often, the range to the target must be estimated to deliver effective fire. This requires you to move the sights to the long-range position. Accurate range estimation requires much practice and should be an integral part of marksmanship training. While there are many techniques of estimation range, the front sight post of the rifle can be used effectively to help you accurately estimate range.

A man-sized target appears to be the same width as the front sight post at a distance of 175 meters. A man can be covered with half of the front sight post at a range of 350 meters. An easy role to remember is this: If the target is bigger than the front sight post, it must be closer than 175 meters; if the target is less than the full width of the post, the target is beyond 175 meters.

The silhouette zeroing target gives you the same perception as a man-sized target at 250 meters. The various scaled silhouette targets give you a way to practice range estimation with the front sight post. This is a method of dry-fire training. You should be aware of the importance of range estimation during all your marksmanship training.

EFFECTS OF GRAVITY

The effects of gravity are precisely documented for the fires of some rifles. However, only approximate data are available on the way gravity affects the M16A2 bullet. General statements about gravity's effects remain true. For instance, the bullet drops as it leaves the bore of the rifle.

Bullet Drop

The bullet is affected by gravity, just as is any other falling object. Even though the bullet is traveling fast, it gradually falls to the ground. If the bore of a rifle is lined up on a 450-meter target, the bullet might hit as much as 64 inches below the spot where the bore is pointing. There is a way to overcome this problem.

Overcoming Gravity

To overcome the effects of gravity and engage targets as easily as possible, the battle sight zero is used. This finds a zero range that allows engagement to the maximum range but needs minimum adjustments to the aiming point. You actually point the bore of the rifle well above the target. This keeps the path of the bullet fairly close to the line of sight. For example, you might need to point the rifle bore approximately 16 inches above the aiming point on a 250-meter target.

Since most trajectory illustrations show only the line of sight and the bullet's flight path, you could get the idea that the bullet rises and falls. The bullet's line of departure is not the line of sight, however. The bullet departs from the bore line, and it always drops from the bore line.

For example, the line of sight and the bullet's trajectory cross paths at approximately 42 meters (in rifles where the bullet starts out just over 2 ½ inches below the sights) and again at about 250 meters. This gives the illusion that the bullet rises and falls.

On the M16A2, adjusting the rear sight elevation allows you to engage targets out to the maximum effective range by shifting the zero point.

BASIC MARKSMANSHIP PRACTICAL EXERCISE CHECKLIST M16A2

Check off all tasks as you complete them. Perform all exercises before you move to the pellet gun range. You have approximately 50 minutes to do these exercises. Some of them an instructor will talk you through, and others you are to do while you are waiting for an instructor. Some of the exercises will require that you have a partner.

INSTRUCTOR ASSISTED:

Work with a partner.

TARGET BOX EXERCISE (FM 23-9, pg C-4)

PRONE SUPPORTED POSITION

- While in the prone supported position:
- Breath Control, Watch effect on sights as you breath, practice breathing for both slow and rapid fire.
- Sight picture.
- Natural Lay (Sight on Target)
- Focusing – Focus on Front sight only!
- Practice trigger squeeze, finger position, (use dime exercise, FM23-9, pg 3-18) dry fire a minimum of 5 times, or until you can dry fire without knocking dime off.
- Call you shots as you dry fire.

PRONE UNSUPPORTED POSITION:

Work with a partner, done after the prone supported instruction

While in the prone unsupported position:

- Breath Control, Watch effect on sights as you breath, practice breathing for both slow and rapid fire.
- Sight picture
- Natural Lay (Sight on Target)
- Focusing – Focus on Front sight only!
- Practice trigger squeeze, finger position, (use dime exercise, FM23-9, pg 3-18) dry fire a minimum of 5 times, or until you can dry fire without knocking dime off.
- Call you shots as you dry fire.
- With heels vertical, move heels while sighting, and note effect on aiming.

CONCURRENT TRAINING:

- Set mechanical zero: Front – flush at abase; rear wind age – align index mark with 0-2 aperture index mark; rear elevation – set to 8/3
- Sight with each aperture and note difference
- Make sight adjustments for the three shot groups on Pretest
- Practice SPORTS three times
- Practice functions check

M16A2 FUNCTION CHECK

A. BOLT TO REAR AND RELEASE

B. SAFETY ON

C. PULL TRIGGER, HAMMER DOES NOT FALL

D. SELECTOR SWITCH TO SEMI AUTO

E. PULL AND HOLD TRIGGER, HAMMER FALLS

F. PULL CHARGING HANDLE TO REAR AND RELEASE

G. RELEASE TRIGGER, CLICK IS HEARD, PULL TRIGGER, HAMMER FALLS

H. SELECTOR SWITCH TO BURST

I. PULL AND RELEASE CHARGING HANDLE

J. PULL TRIGGER AND HOLD, HAMMER FALLS

K. PULL AND RELEASE CHARGING HANDLE THREE TIMES

L. RELEASE AND PULL TRIGGER, HAMMER FALLS